SPACE BASED INFRARED SYSTEM (SBIRS) SYSTEM SIMULATION (S3)

C2 Modeling and Simulation Symposium, 27 - 28 April 1999

Command and Control Battlelab (C2B)

Air Force Agency for Modeling and Simulation (AFAMS)

Presented by

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PURPOSE

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- **Discuss S3 Applications at the JFACC Level and Below**
  - Decision Support via Training
  - Command and Control (C2) Process Modeling
- **Describe Potential Solutions to C2 Decision Support and C2 Process Modeling Systems**
  - Long-Range Planning
  - Course of Action Analysis
  - Campaign Modeling
- **Potential S3 Application for Support of Process Models to Facilitate C2 Tradeoff Analysis for Changes in:**
  - Personnel
  - Procedures
  - Equipment

CONTRACT BACKGROUND

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- **Member of the SBIRS High Component Prime Contractor, Lockheed Martin Missiles and Space, Team**
  - Support Systems Engineering
  - Leading the Development of the SBIRS System Simulation (S3)

SBIRS OVERVIEW

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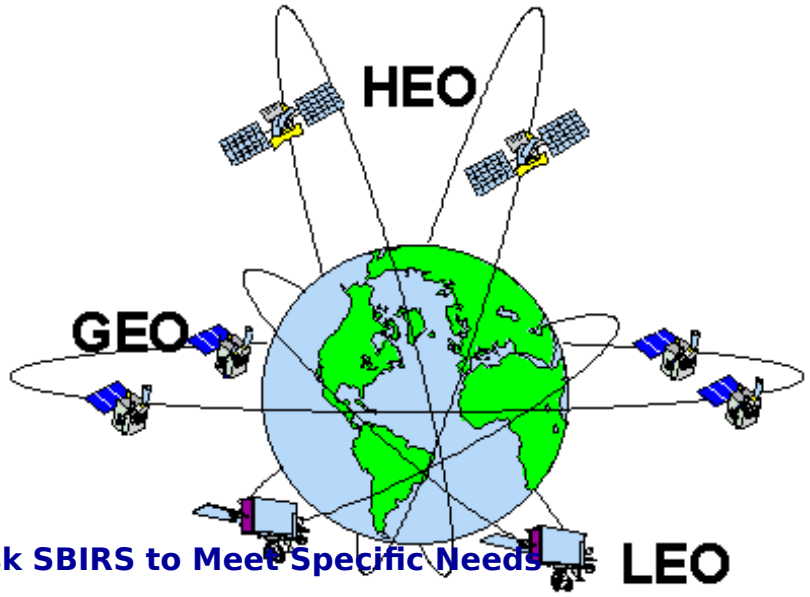
- **http://www.laafb.af.mil/SMC/MT/sbirs.htm**
- **Addresses Critical Warfighter Needs**
  - Missile Warning
  - Missile Defense
  - Battlespace Characterization
  - Technical Intelligence
- **Three Phases of Development**
  - Increment 1 – Modernize Ground Segment of DSP
  - Increment 2 – Adds SBIRS High (GEO and HEO) Component
    - Replaces the existing DSP missile warning satellites
    - Will provide direct-to-the-theater missile warning and battlespace characterization to the warfighter
  - Increment 3 – Adds SBIRS Low (LEO) Component



- **A Major Improvement Over DSP Will Be the Ability to Task SBIRS to Meet Specific Needs**
  - Two Sensors (Scanner and Starer) per GEO Satellite
  - Starer Dedicated to the Theater (MRCs, FAs, Cas) for Increased Coverage in Area of Interest
- **A Centralized Overhead Tasking Authority**
  - Assign Priorities and Tasking Requests

S3 OVERVIEW

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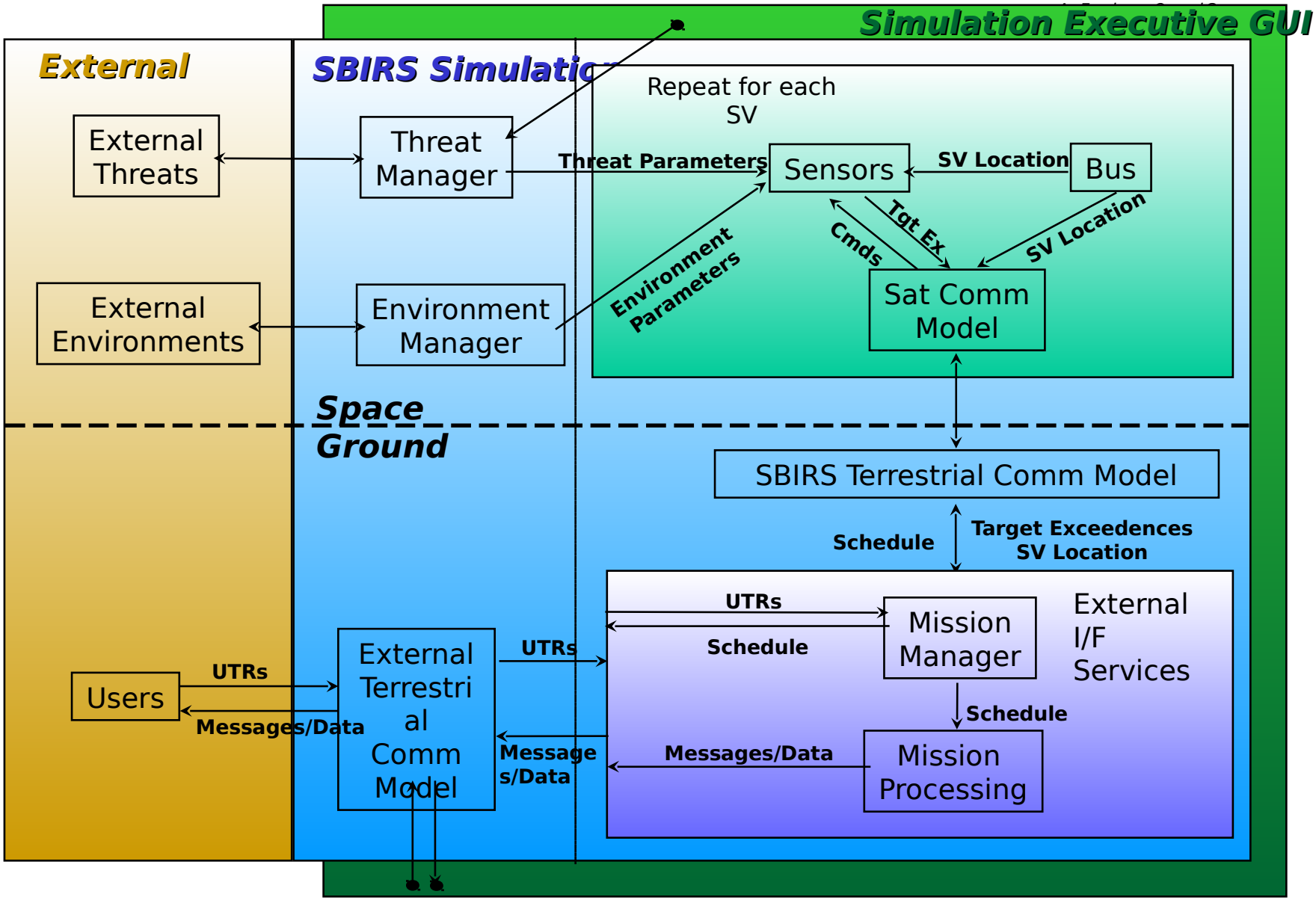
- **The Intended Uses of S3**
  - Computer-Aided Wargaming
  - Training
  - Exercise Support
  - System Testing
- **S3 Will Be a System-Level Simulation**
  - Capable of Receiving Tasking Requests
  - Generating Simulated SBIRS Messages
    - Pre-planned
    - Ad Hoc threat scenarios
- **Future Capabilities**
  - Simulate the Battlespace Characterization Capabilities of SBIRS Sometime After the 2001 Timeframe
  - Delivery of the S3 Initial Capability Is Currently Scheduled for Winter 2000

SBIRS SYSTEM SIMULATION



SBIRS SYSTEM SIMULATOR ARCHITECTURE

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- **S3 Reflects the Architecture of the Actual SBIRS System**
  - A Simulation Interface Layer
    - Threat Manager – receives external threats and provides threat parameters to the sensor model
    - Environment Manager – receives externally specified environment information and provides a model for atmospheric propagation of infrared energy
    - External Terrestrial Comm Model – provides the interface between external users and the core simulation

SBIRS SYSTEM SIMULATOR ARCHITECTURE (Cont.)

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- **The Core Simulation**
  - The Space Element – Incorporates a Model of Each Space Vehicle Including the Sensors, Bus, and Communications Subsystem
  - The Ground Element – Simulates the Mission Processing and Mission Management Functions of the SBIRS MCS Ground Station

SBIRS SYSTEM SIMULATOR ARCHITECTURE (Cont.)

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- **Simulation Executive**
  - Provides Overall Control of the S3 Components and an Operator Interface
  - S3 Operator
    - S3 configuration control
    - Data generation
    - Simulation execution control
    - Display status and results

S3 EXTERNAL INTERFACES

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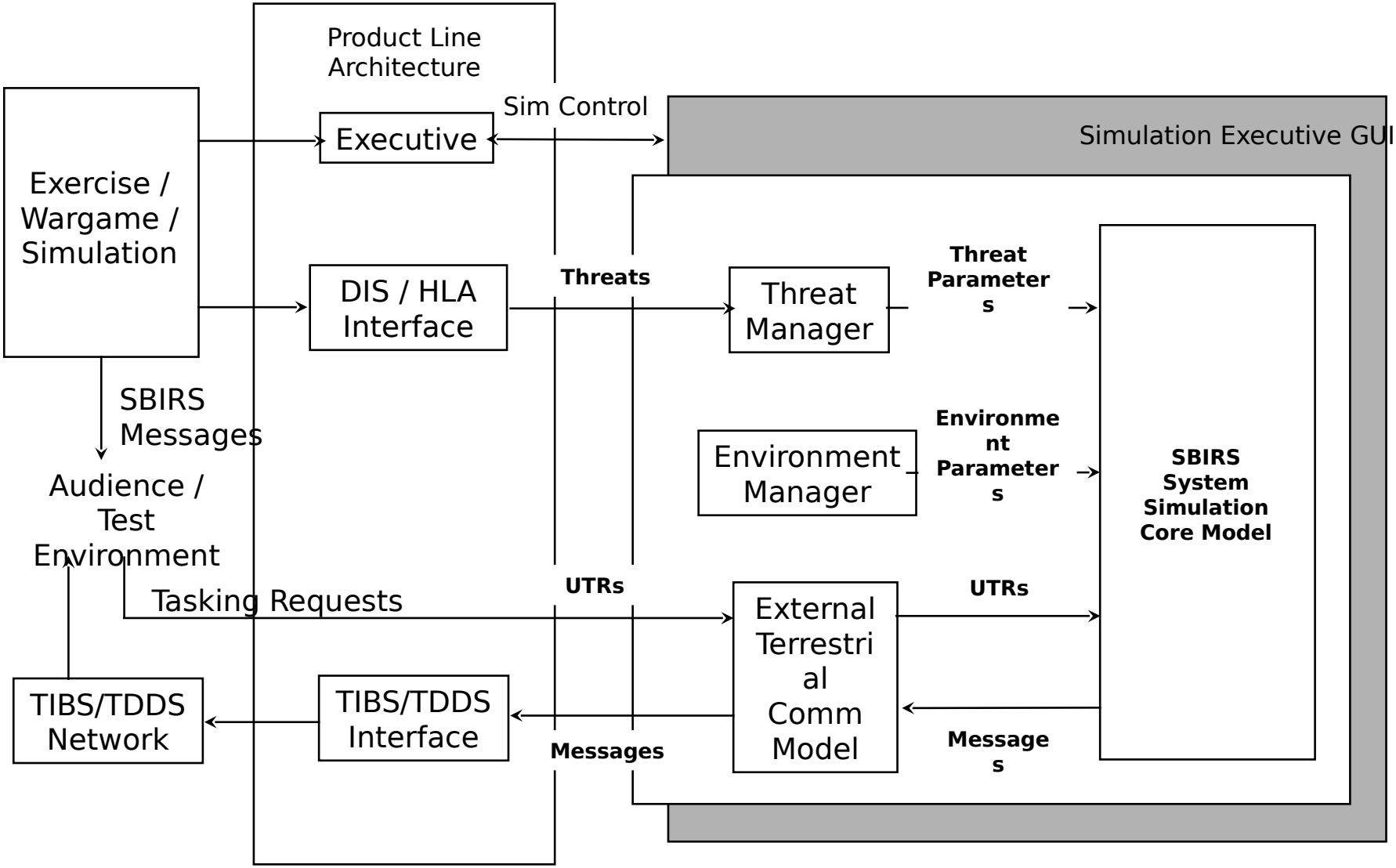

INTEGRATING S3 FOR PROCESS MODELING

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- **Primary Interfaces**
  - DIS (Distributed Interactive Simulation) / HLA (High Level Architecture) Interface That Receives Missile State Information From the Training Simulation
  - TIBS/TDDS Interface That Is Certified to Transmit Messages Into the Operational Communication Network

S3 APPLICATIONS AT THE JFACC LEVEL AND BELOW

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- **Decision Support Via Training**
  - Provide Real-World Inputs Via Training Environment
  - Utilize Live Communications Links (TIBS/TDSS)
- **Command and Control Process Modeling**
  - SBIRS Task Coordination for Training and Doctrine Development
    - Other surveillance systems
    - Future missile defense assets (e.g., Airborne Laser)

NOTIONAL SCENARIO INVOLVING SBIRS (In the Context of an Air Expeditionary Force (AEF) Experiment)

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- AEF Staff Prepares a Tasking Request for SBIRS While Enroute
- SBIRS Tasking Is Coordinated With Theater Missile Defense (TMD) Deployment
- S3 Processes the Tasking Request and Simulates the Resulting System Coverage (Global, MRC, FA)
- During the Simulated Battle, the Opposing Force Launches Theater Ballistic Missiles (TBM)
- S3 Simulates the Detection and Missile Tracking Processes as Well as the Resulting Warning Message Outputs
- Simulated Theater Missile Defense Assets Receive the Warning Messages and Engage the Incoming Threats

POTENTIAL SOLUTIONS TO C2 DECISION SUPPORT AND C2 PROCESS MODELING SYSTEMS

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- **S3 Provides Realistic Inputs for:**
  - Long-Range Planning
    - Determine potential warning delays
    - Staff load analysis
  - Courses of Action and Campaign Modeling
    - Supports inclusion of SBIRS

SBIRS COMMAND AND CONTROL ISSUES

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- **New Planning and Assessment Roles for JFACC Staff**
- **SBIRS Tasking**
  - A New Element in the Operations Planning Cycle, the Doctrine for Which Remains to Be Developed
  - SBIRS Battlespace Characterization Will Be a New Source of Information for Air Staffs

S3 APPLICATION FOR SUPPORT OF PROCESS MODELS TO FACILITATE C2 TRADEOFF ANALYSIS

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- **Supports Analysis of Personnel, Procedures, and Equipment Requirements**
  - Personnel Needs Under Varying Attack Scenarios
  - Equipment Needs Under Varying Attack Scenarios
    - Communications
    - Operator terminals (CTAPS)
  - Procedure Modifications

SUMMARY

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- **SBIRS Will Require New JFACC Staff Functions**
  - Tasking Requests
  - Tasking Coordination
- **S3 Can Support C2B Process Modeling and Decision Support Activities**
- **S3 Can Support Tradeoff Analyses**
- **S3 May Support Future M&S Exercises (e.g., Blue Flag)**